

### III. ENVIRONMENTAL SETTING

#### A. PHYSIOGRAPHY, GEOLOGY, AND SOILS

The Ford Farm Site, which is about 3 kilometers (1.9 miles) northwest of Dover, is located within the Mid-drainage area of the Atlantic Coastal Plain physiographic province. This is a level and low-lying surface between the Delaware shore zone and the drainage divide that separates the waters flowing into the Chesapeake Bay and those flowing into the Atlantic Ocean. The Coastal Plain is composed principally of unconsolidated sands, clays, and gravels of marine and fluvial origin.

The site occupies an upland setting overlooking the upper St. Jones River (Fork Branch) at an elevation of approximately 12 meters (40 feet) above sea level. In spite of its upland position, the site, like the nearby Blueberry Hill Site, has been buried by aeolian sediments. Two bay/ basin features, small wetland depressions in the landscape that are common near the project area, are located southwest of the site (Heite and Blume 1995b:17). There are also wetland areas nearby, within the floodplain of Fork Branch. During prehistoric times, these floodplain swamps would have provided attractive habitats for large and small game as well as for waterfowl.

The local geology underlying the site is composed of the Pleistocene-age Columbia Formation (Jordan 1964), medium to coarse sands and gravels of probable fluvial origin. In the vicinity of the Ford Farm Site, these sediments are estimated to be approximately 6 meters (20 feet) thick (Jordan 1974). One explanation for the origin of the Coastal Plain uplands such as those surrounding the Ford Farm Site has been proposed by Knox (1983). According to Knox (1983), the Coastal Plain uplands may be the result of rapid downcutting by area streams during periods of extensive runoff. This would have occurred throughout the late Pleistocene and into the early Holocene. Patterns of precipitation during the early Holocene eventually resulted in the accumulation of stable floodplain deposits in many of the stream valleys in eastern North America. By 6,000 years ago, however, the climatic pattern shifted to one dominated by more intense storm activity and river channel cutting. Downcutting in Coastal Plain stream valleys at this time would have resulted in the isolation of the older floodplain deposits in settings of higher elevation. This pattern was again followed by a trend toward the accumulation of floodplain sediments.

Another means of sediment accumulation on Delaware's Coastal Plain was the intense aeolian or wind-blown deposition of fine sediments, which appeared to be most prevalent during the period between 6,000 and 2,000 years ago, during the Xerothermic maximum (Carbone 1976; Curry 1980). Foss et al. (1978) describe differences in loess thickness based on distance from Chesapeake Bay. Localities sampled from areas closest to the bay typically showed thicker post-Pleistocene loess cover. Similar patterns may be expected for the regions closest to Delaware Bay.

Curry and Ebright (1990:7) have noted that sites on the western shore of Maryland buried by aeolian sediments may be differentially buried, that is, unevenly blanketed with fine-textured sediments. Some components are thus buried more deeply, while others are either shallowly buried or mixed

with earlier and later occupations. Archaeological sites buried by these processes, as has already been mentioned, include sites all around the Chesapeake Bay region as well as in northern Delaware. The same factors were responsible for the burial of sites under fine sediments in the middle and lower Delaware Valley, such as at the Abbott Farm National Landmark sites, near Trenton, New Jersey. Extensive investigations at Abbott Farm (Stewart 1987) and at sites in Delaware (Ward and Bachman 1987) have provided substantial documentation on the burial of Coastal Plain sites by wind-blown sediments.

Custer (1999), for example, notes that periodic droughts during the Holocene may have been responsible for the varying amounts of aeolian deposition throughout Delaware. Markewich and Markewich (1994) also note the prevalence of drought conditions in eastern North America as a factor in aeolian erosion and redeposition, particularly with regard to dune formation. Although the Markewiches' study was focused on Georgia and the Carolinas, its findings have implications for dune formation in southern Delaware during the period from 15,000 to 3,000 years ago.

According to Custer (1999), aeolian events more recent than 3000 years before the present (BP) have resulted in the burial of sites, such as the Gum Branch Site (7S-E-83C), in Sussex County, Delaware. Earlier horizons, dating to 3,000 to 10,000 BP, however, are missing from the profiles of these sites, providing evidence of the uneven nature of aeolian erosion/deposition cycles; this unevenness can be measured from site to site as well as within the space of as little as 30 meters within a site (Custer 1999:183). The same pattern has been replicated at a number of sites in southern Delaware, as noted by Blume (1995), and similar conclusions can be drawn in each case.

The upland areas in the vicinity of the Ford Farm Site are mapped as the Sassafras-Falsington Association. These are deep, well-drained soils formed in sandy sediments. Soils below the bluff edge, that is, along the St. Jones/Fork Branch floodplain, are classified primarily as swamp, with some soils of the Johnston Series present as well. Johnston Series soils are recently formed and poorly drained soils (Matthews and Ireland 1971).

## B. REGIONAL LITHIC RESOURCES

Cobbles of chert, jasper, quartz, and quartzite, as well as other siliceous materials, are found in secondary deposits in the region and were most likely utilized extensively by the occupants of the Ford Farm Site. Many of these lithic resources, particularly quartz, quartzite, and jasper, originate in the metamorphic formations of the Piedmont physiographic province. Rhyolite, which is represented to a minimal degree in the site assemblage, originated in the Blue Ridge mountains. The use of rhyolite is very evident in assemblages from the Late Archaic period in the Coastal Plain and Piedmont physiographic provinces, when perhaps the first marked expressions of trade are found in the region.

Debitage composed of these raw materials dominates most sites in the eastern Piedmont and the Coastal Plain. Many of the raw materials represented originated in secondary deposits of cobbles, as is evidenced by the predominance of cobble cortex on artifacts from a large number of the

region's sites. Custer and Galasso (1980) provide a comprehensive inventory and description of many of these Coastal Plain lithic raw materials.

Primary sources of siliceous raw materials in Delaware are also found within what is called the Delaware Chalcedony Complex (Wilkins 1976), a deposit found in the northern part of the state containing cherts, jaspers, and chalcedonies of variable knapping quality. Most of these materials are probably jaspers of unspecified knapping quality (Custer 1989:56) such as the material called Iron Hill jasper, found in an aboriginal quarry context at Site 7NC-D-34, in northwestern New Castle County.

Argillite, found in Lockatong Formation deposits in the Piedmont region of northern Mercer County, New Jersey (Didier 1975; Widmer 1965:21-22), is also common on sites in the region (Custer 1989), although very little of this material was recovered from the Ford Farm Site. Argillite was widely used for the manufacture of stone tools at the Abbott Farm archaeological site complex near Trenton, New Jersey, since as early as the Late Archaic period. Its popularity as a raw material declined during the Late Woodland period, when it was replaced by jasper, chert, and other siliceous raw materials (Wall et al. 1996). Secondary or cobble sources of argillite were also utilized extensively.

### C. PALEOENVIRONMENT

An overview of Middle Atlantic region paleoenvironments provided in the work of Carbone (1976) gives the background data essential for modeling man-land relationships throughout the Holocene. The description given below briefly outlines major events and shifts in the composition of environmental settings that may have influenced prehistoric settlement patterns and lifeways in the Atlantic Coastal Plain. Relevant pollen data from the Middle Atlantic region come principally from Buckle's Bog near Meadow Mountain in western Maryland (Maxwell and Davis 1972), and from Crancsville Swamp, near the West Virginia-Maryland boundary (Cox 1968). Other pollen data are available from sources closer to Delaware, but incomplete profiles and lack of radiocarbon-dated contexts make these data less useful. One of the more complete pollen sequences relevant to northern Delaware is from Dismal Swamp in northern Virginia (Whitehead 1972).

The climate circa 12,000 years ago, when the first aboriginal peoples entered the region, was relatively cool and wet compared to the present. Late Glacial period environments included forests dominated by spruce and pine as well as a mixture of other arboreal species not found in any present-day settings. Pollen sequences derived from coring bay/basin features in central Delaware show a predominance of spruce, pine, and birch at circa 11,000 BP (Webb et al. 1994). The cool, wet climate would have provided suitable conditions for the development of bogs, ponds, and other types of wetlands throughout the Coastal Plain. Relict bog sites in many areas of the Middle Atlantic have produced evidence, such as fluted and Early Archaic projectile points, of early Holocene occupations. Environments of these types were prevalent throughout the Coastal Plain.

The St. Jones River system and nearby drainages were subjected to marked changes over the last 10,000 years, as were most fluvial systems along the Atlantic coast. In late Pleistocene times, when

the Atlantic Coastal Plain was far more extensive than it is today, the St. Jones River was downcutting through pre-Holocene sediments characterized by a patchwork of wetland and well-drained surface features. With the withdrawal of the glaciers from areas further north, and with it a significant rise in sea level, the Delaware River and other smaller coastal streams slowly expanded into viable estuarine systems. These estuarine systems had more or less stabilized by 6000 BP, and by 3000 BP tidal water boundaries had reached their present-day limits (Kraft 1977). These systems provided the basis for incipient Woodland I subsistence practices as the Delaware Coastal Plain and interior environments assumed a modern character.

In late Pleistocene and early Holocene times, the fauna inhabiting the area would have included megafauna such as mastodon, mammoth, sloth, moose, caribou, bison, and musk-ox (Carbone 1974:94). Remains of such species have been found in submerged contexts along the Atlantic continental shelf (Edwards and Merrill 1977). Similar faunal assemblages have also been recovered from montane regions of the Middle Atlantic, particularly from cave and salt lick sites such as New Paris No. 4 Sinkhole (Guilday et al. 1964), Natural Chimneys (Guilday 1962), Clark's Cave (Guilday et al. 1977), and Cumberland Bone Cave (Franz and Slifer 1971; Gidley 1918).

By Middle Holocene times, climatic warming trends had brought about an increase of deciduous elements in the forests, resulting in the development of forests of mixed deciduous-coniferous composition. Pollen data from Cranberry Glades, West Virginia, show a pine-birch forest around 9500 BP, followed by a forest dominated by oak, hemlock, and birch (Carbone 1976; Darlington 1943). In some of the broader valleys there is evidence of an oak forest, with conifers not as well represented (Gardner 1987). In Delaware, after 6000 BP pollen data show a significant rise in oak (*Quercus*) and buttonbush (*Cephalanthus*) (a wetland species), both predominant in modern vegetation assemblages. This finding is supported by more recent core sampling of localities within Delaware, such as Walter's Puddle, Longhauser Pond, and Nowakowski Pond (Webb et al. 1994).

The pollen studies also show a significant hiatus in sedimentation in each of the sampled basins from circa 12,000 to 6000 BP. This observation seems to indicate that desiccation and deflation of earlier sediment packages occurred (Webb et al. 1994:46). The relatively dry climate may also have affected distributions of human activity in the region. The implications of the data are that the dry period may have lasted anywhere from 100 to 5,000 years (Kellogg and Custer 1994:97), although it is likely that a portion of the sediments laid down after 12,000 BP were deflated by aeolian activity during the subsequent dry climatic episode.

After 11,000 BP bay/basin features may have been sought as viable sources of fresh water in a region that was broadly affected by the drying climatic trend. These bay/basin features may also have been attractive settings for a variety of game species, thereby increasing the importance of these settings as critical resource areas (see Kellogg and Custer 1994:98-99). The overall rarity of archaeological sites in Delaware dating prior to 6500 BP may be at least partially explained by the dry climate (Kellogg and Custer 1994:98). When found, Archaic sites in the region tend to be located near sources of fresh surface water.

Following 8500 BP, a warm and moist climate supported the growth of deciduous forests. Subsequently, during what is termed the mid-postglacial Xerothermic (5000-3000 BP), a drier climate supported xeric deciduous forests. During this period, hickory, chestnut, and oak would have been the predominant forest species, providing an increasing abundance of nut resources in the region upon which the regional small mammal population subsisted. It is during this time that upland resources of the Coastal Plain would have been heavily exploited by Woodland I groups. A more open character in some of the region's forests would also have been common during this Xerothermic interval, creating greater diversity in regional habitats and increasing the carrying capacity of the environment (Custer 1994).

Many of the faunal species characteristic of the area in late Pleistocene and early Holocene times were no longer present, as the faunal assemblage by this time had assumed a more or less modern character. However, the area would have remained a productive environment for hunting and trapping of both large and small game. After 6500 BP settlement around bay/basin features was relatively common, but use of such settings diminished in Woodland II times. This may be explained by a much lessened need for sources of fresh water as a result of the moist climatic conditions (Custer 1994).

By about 3,500 years ago, an essentially modern climate and associated forest cover characterized the region. Some shifts between wet and dry episodes over the last 2,500 years have been observed in paleoenvironmental data collected in the St. Jones River valley (Custer 1994:12). However, these shifts over recent millennia may be interpreted as minor deviations in a modern pattern rather than major changes in the climatic regime such as those that occurred earlier (Carbone 1976). These minor shifts, as expressed over a much larger region, include a cool, dry period from about AD 250 to 650 and another period of climatic deterioration, termed the Little Ice Age (AD 1200 to 1250) (Baerreis et al. 1976). Although these climatic alterations were not catastrophic in their effect on peoples living in the Middle Atlantic Coastal Plain area, some settlement shifts may have occurred in response to changes in the distribution of associated plant and animal populations.

The most apparent settlement shifts in the St. Jones River valley and other Coastal Plain river systems would have been related to upstream shifts in the oligohaline zone (freshwater-brackish water boundary area) (Custer 1994:102). Since this was one of the more productive habitats utilized by prehistoric inhabitants of the region, the locations of procurement sites and their associated macro- and microband camps would have moved accordingly. That is, given the gradual sea level rise throughout the Holocene, Woodland I camps would be expected to have been located in areas further upstream than camps of earlier periods (Custer 1994).

The setting at the Ford Farm Site would have provided the requirements necessary to sustain a variety of temperate fauna, such as deer, bear, and elk, as well as smaller game animals. Fish and shellfish would have been readily available in the nearby St. Jones River. Faunal species lists from excavated sites in the region show that shellfish as well as deer and small mammals were an important component of prehistoric subsistence, especially in Woodland times.

The project area is contained within the Chestnut Oak-Post Oak-Blackjack Oak forest association (Braun 1950; Brush et al. 1976). The flora of this forest group includes red maple, black gum, white oak, sassafras, greenbrier, American holly, and Virginia pine. The vegetation in the project area can be characterized as oak-chestnut forest, with upland areas represented by mixed deciduous forests. Shelford (1963) includes the project area within the temperate deciduous forest biome (or oak-deer-maple biome). The region would have provided aboriginal populations with rich and varied biotic resources in the form of nuts, seeds, berries, fish, large and small mammals, and birds. The site is presently forested.

The modern climate in the region is humid continental, with local variations resulting from differences in elevation, slope, and valley position. Precipitation averages about 40 inches per year. The average annual temperature is 54 degrees Fahrenheit and the average number of days with temperatures below freezing is between 100 and 110 (Matthews and Ireland 1971).